1. Suppose that a statistician studying the effect of a treatment on blood pressure find that the 95% confidence interval for the mean change in blood pressure, recorded as pre-intervention minus post-intervention, among 100 patients is (1.52, 5.39). Which of the following is true?
   1. A hypothesis test for the mean change where the and would produce a p-value greater than .05.
   2. The probability of the true mean change in blood pressure is between 1.52 and 5.39 is 95%.
   3. A hypothesis test for the mean change where the and would produce a p-value less than .05.
   4. The true mean change in blood pressure is between 1.52 and 5.39.
2. Suppose a cancer clinical trial to test the effectiveness of a new immunotherapy on tumor reduction in late stage lung cancer patients was being presented to you. The PI for the trial has collected data on 50 cancer patients, where the data collected included demographic data about the patient, the patient’s tumor size at the beginning of the trial, and the patient’s tumor size at the end of the trial. Which of the following hypothesis tests would be the appropriate method to analyze the data in order to answer the main research question.
   1. One Sample T-test
   2. Two Sample Independent T-test
   3. Two Sample Dependent T-test
   4. One Sample Z-test
   5. Two Sample Z-test

Suppose that in a clinical trial for heart disease with 200 patients had the goal of reducing systolic blood pressure in high risk patients over a year long period. Two treatments, treatment A and treatment B, were compared against each other. In the treatment A group, 25 out of 100 patients saw a clinically relevant reduction in systolic blood pressure whereas in the treatment group B 30 out of 100 patients had a clinically relevant reduction in systolic blood pressure.

1. What is a 99% confidence interval for the probability of having a clinically relevant reduction in systolic blood pressure given that you received treatment A? (HINT: USE AN EXACT METHOD, NOT AN APPROXIMATION)
   1. (.17,.35)
   2. (.15,.38)
   3. (.21,.4)
   4. (.19,.43)
2. What is a 99% confidence interval for the probability of having a clinically relevant reduction in systolic blood pressure given that you are in treatment B? (HINT: USE AN EXACT METHOD, NOT AN APPROXIMATION)
   1. (.21,.4)
   2. (.19,.43)
   3. (.17,.35)
   4. (.15,.38)
3. Use a 95% confidence hypothesis test to determine which treatment is better.
   1. Treatment A
   2. Treatment B
   3. Treatment success could not be differentiated.
4. Suppose that the age of students at MUSC is normally distributed with mean 25 and standard deviation 10. If a sample of 500 students were taken, what would be the distribution of the sample mean?
   1. Normal with mean 25 and standard deviation 10.
   2. Normal with mean 25 and standard deviation .447.
   3. Normal with mean 25 and standard deviation .02.
   4. Standard normal
5. When is the normal approximation method for confidence intervals?
   1. When the sample size is large and npq>5
   2. When the sample size is large and npq<5
   3. When the sample size is small and npq>5
   4. When the sample size is small and npq<5
6. Suppose that the number of exams taken by graduate students in their 1st semester is distributed as a poisson distribution with lambda = 10, what is the distribution of the sample standardized mean?
   1. Poisson with lambda = 10
   2. Normal with mean = 10 and standard deviation = 10
   3. Normal with mean = 0 and standard deviation = 1
   4. Poisson with lambda = 0
   5. It depends on the sample size
7. Given a large enough sample size with probability close to .5, can you use the Students t distribution to approximate a 95% confidence interval for binomial data?
   1. Yes, it is the method that is used frequently in statistics.
   2. No, it is
   3. Yes, but you should not as the normal approximation is better.
   4. No, you should never approximate confidence intervals.
8. Suppose a clinical trial for a new medication for preventing stroke has enrolled 100 patients which have been randomly assigned into one of two groups, treatment or control. The PI of the study wants to determine if the treatment drug is better at reducing the number of stokes a patients has over the duration of the study period when compared to the current standard of care. What type of hypothesis test would be appropriate to answer the PI’s main research question?
   1. One Sample T-test
   2. Two Sample Independent T-test
   3. Two Sample Dependent T-test
   4. One Sample Z-test
   5. Two Sample Z-test
9. Suppose that a paired t-test with an alpha of .05 was conducted in order to see if a new weight loss supplement had a significant impact on the number of pounds lost by subjects. The resulting p-value of the test was .025. Which of the following confidence intervals could be the confidence interval for the mean change in weight, as defined by pre-intervention minus post-intervention? (Choose all that apply)
   1. (-7.48,3.9)
   2. (-11.12,-2,4)
   3. (-3.22,5.34)
   4. (1.11,3.45)
10. In regards to hypothesis testing…
    1. The p-value is the probability of obtaining a result as or more extreme than you did by chance alone, assuming the null hypothesis is false.
    2. The p-value is the probability of obtaining a result less extreme than you did by chance alone, assuming the null hypothesis is true.
    3. Small p-values indicate that the observed data are unlikely when the null is true
    4. Large p-values indicate that the observed data are unlikely when the null is true
11. Which of the following is the correct definition for Type 1 and Type 2 errors? ( Choose all that apply)
    1. Type 1 = Claiming the alternative is true when the null is actually true.
    2. Type 1 = Failing to reject the null when the alternative is actually true.
    3. Type 2 = Claiming the alternative is true when the null is actually true.
    4. Type 2 = Failing to reject the null when the alternative is actually true.

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| --- | --- | --- | --- |
|  | Lung Cancer | No Lung Cancer | Total |
| Smokers | 50 | 500 | 550 |
| Non-Smokers | 10 | 1500 | 1510 |
| Total | 60 | 2000 | 2060 |

1. Given the 2x2 table above, what are the odds of a patient who smokes developing lung cancer?
   1. 5
   2. 10
   3. .1
   4. .5
2. Given the 2x2 table above, what is the odds ratio of a patient who smokes developing lung cancer when compared to a patient who does not smoke?
   1. 0
   2. 15
   3. .067
   4. 13.72
3. Given the 2x2 table above, what is the relative risk for a patient who does not smoke developing lung cancer when compared to a patient who does smoke?
   1. .073
   2. 13.73
   3. 7.3
   4. 137.3
4. Suppose that you are given a dataset with 2 groups and 10 observations per group, that you believe to be non-normally distributed and that the data is paired. What type of significance test should you perform to determine if there is a difference between the data?
   1. Paired t-test
   2. Two-sample t-test
   3. Signed Rank test
   4. Wilcoxon Rank Sum
5. Suppose that you are given a dataset with 2 groups and 10 observations per group, that you believe to be non-normally distributed, and that the groups are independent. What hypothesis test should you conduct to determine if there is a difference between the two groups?
   1. Paired t-test
   2. Two-sample t-test
   3. Signed Rank test
   4. Wilcoxon Rank Sum
6. Suppose that you are given a dataset with two independent groups of subjects which you believe to be normally distributed and there are 500 observations per group. What hypothesis test should you conduct to determine if there is a difference between the two groups?
   1. Paired t-test
   2. Two-sample t-test
   3. Signed Rank test
   4. Wilcoxon Rank Sum
7. Suppose that you are given a dataset with 2 groups and 10 observations per group, where the data is paired and normally distributed. Which significance tests are appropriate to perform on the data to determine if there is a difference between the data?
   1. Paired t-test or Signed Rank test
   2. Paired t-test or Wilcoxon Rank Sum test
   3. Two Sample t-test or Signed Rank test
   4. Two Sample t-test or Wilcoxon Rank Sum test